

CURARE, AN AID IN THE SURGERY OF CATARACT *

EKACHAI BHARKSUWANA, M.D., AND WALTER J. MAHER, M.D.

Department of Ophthalmology
St. Clare's Hospital
New York, N.Y.

THE cataract surgeon usually has preferred local anesthesia because of the low incidence of side effects and complications. He is enabled to perform the operation with greater delicacy and precision when the patient and his eyes are quiet and relaxed. Kirby in 1949 was the first to use the combination of local anesthetics and curare to obtain the five desiderata of cataract surgery: 1) sedation, 2) analgesia, 3) anesthesia, 4) palpebral and global akinesia, and 5) basal or general akinesia.

The special value of curare in the surgery of cataract lies in the selective sequence of the paralysis which it produces. This affects first the muscles innervated by the cranial nerves, then the extremities, and lastly the respiratory muscles. The involvement is observed in sequence, i.e., transient blurring of vision, facial flaccidity, ptosis, paresis of vertical ocular muscles followed by that of the horizontal group, and relaxation of the muscles of the jaw, pharynx, and neck. Curare has neither analgesic nor anesthetic properties. It must be used in combination with analgesics and anesthetics.

Curare is ineffective orally and is unpredictable when given intramuscularly. It acts in a matter of seconds when given intravenously. The effect reaches a maximum in three to five minutes and wears off in 20 to 25 minutes. Repeated injection tends to have a cumulative effect. The initial dosage of d-tubocurarine is 15 to 30 mg.; a supplementary dose of 5 to 10 mg. is required to produce apnea in general anesthesia. For the extraction of cataracts the required dosage averages 20 to 60 units or 3 to 9 mg. of d-tubocurarine.

The relaxation of control afforded by curare establishes a safe margin not obtainable by other methods. The drug may be used routinely

*Presented before the Section on Ophthalmology of the New York Academy of Medicine May 19, 1975.

in operations for cataract except in the presence of myasthenia gravis, marked renal insufficiency, emphysema, asthma, borderline respiratory function, or hypersensitivity to histamine.

PRESENT INVESTIGATION

A series of patients, unselected except for the exclusion of those in whom the use of the drug is contraindicated, was subjected to cataract extraction at St. Clare's Hospital between January 1, 1967 and December 31, 1973. Dimethyl tubocurarine (Metubine) was chosen because it seldom produces respiratory depression. No cardiovascular or cerebral effects were noted and there was no evidence of histamine-like action or of disturbance of the autonomic nervous system. The degree of relaxation was comparable to that obtained with d-tubocurarine but the duration of action was slightly greater. Dimethyl tubocurarine is approximately three times as potent as d-tubocurarine.

Routine preparation of the patient was carried out and sodium pentobarbital (Nembutal), 100 mg., was given orally at bedtime on the night preceding the operation. Two hours before the operation the same dose of pentobarbital was given intramuscularly and chloral hydrate, 20 gr., was given by rectum. Chloral hydrate has proved a safe synergistic drug when used in combination with barbiturates, meperidine, and curare in order to produce perfect basal analgesia. Pentobarbital was replaced by chloral hydrate in older patients and in those who reacted poorly to previously administered pentobarbital. Meperidine (Demerol), 50 mg., with promethazine hydrochloride (Phenergan), 25 mg., was given intramuscularly 30 minutes before the operation, and 0.5% tetracaine hydrochloride was then instilled every five minutes.

With the patient on the operating table, Van Lint palpebral akinesia was induced by infiltration of 2% lidocaine (Xylocaine). At this time, if the patient was still hypersensitive to pain, an additional 25 to 50 mg. of meperidine was given intravenously to verify that the patient had attained an adequate basal analgesia. At the beginning of the operation dimethyl tubocurarine was given intravenously at a rate of 1 mg. per minute. The patient was observed for three to five minutes. If the eyes did not remain stationary in the primary position for this period, additional 1 mg. doses of tubocurarine were given in the same manner until the desired clinical endpoint was observed. The maximum effects must

RESULTS OF CATARACT EXTRACTIONS

	<i>Maximum</i>	<i>Minimum</i>	<i>Average</i>
Age in years	91	52	75
Weight in pounds	220	76	126
Dimethyl tubocurarine			
in mg.	8	0	1.86
in units	160	0	37.20
<i>Complications</i>			
Hyphema	1		
Choroidal detachment	1		
Expulsive hemorrhage	1		

be present when the eye is opened and the cataract is being extracted. During the operation the anesthesiologist administered oxygen by nasal cannula and monitored the patient's vital signs.

Curarization with local anesthesia progresses through three stages. First there is the stage of relaxation, which suffices for the average patient. Second is the stage of paralysis of ocular muscles and paresis of skeletal muscles. This stage is desirable for those in whom apprehension and movement persist despite adequate sedation, analgesia, and local anesthesia. The diminution of respiration in this stage does not produce serious effects. Third is the stage of total paralysis. This is undesirable and is to be avoided.

RESULTS

There were 94 cataract-extraction procedures performed in 73 patients. There were 11 procedures in which curare was not needed because at the beginning of the operation the patient slept quietly and the eyes were stationary and in primary position. The data on the remaining patients are shown in the accompanying table.

CONCLUSION

The smaller dosages of curare are sufficient for quieting the patient and achieving ocular akinesia. Slow injection and constant attention to the sequence of muscular relaxation have made the drug safer to use and account for the rarity of embarrassing events. The eye is not incised until the maximal effect of the intravenous curare and the danger

of paralysis have passed; this takes two to three minutes. If the condition of the patient is satisfactory at this time, respiratory embarrassment will not be experienced later. The surgeon may proceed with the operation on a quiet eye in a quiet body. This increases the proportion of successful operations.

GENERAL REFERENCES

- Adriani, J.: Tubocurarine. In: *The Pharmacology of Anesthetic Drugs*, fifth ed. Springfield, Ill., Thomas, 1970, p. 155.
- Agarwal, L. P.: Curare and curarelike products in cataract surgery. *Brit. J. Ophthalmol.* 37:558, 1953.
- Agarwal, L. P. and Mathur, S. P.: Curare in ocular surgery: Report of 25 cases. *Brit. J. Ophthalmol.* 36:603-10, 1952.
- Barraque, Moner, J.: The present technique and results of the use of curare in ocular surgery. *Amer. J. Ophthalmol.* 36:789-94, 1953.
- Cordes, F. C. and Mullen, R. S.: The use of curare in cataract surgery. *Amer. J. Ophthalmol.* 34:557-64, 1951.
- Doherty, W. B.: Use of chloral hydrate in cataract surgery. *Amer. J. Ophthalmol.* 35:1370-71, 1952.
- Farquharson, H.: Curare with local anesthesia in cataract surgery. *Amer. J. Ophthalmol.* 34:554-57, 1951.
- Henderson, J. W.: Curare akinesia in cataract operations. *Amer. J. Ophthalmol.* 36:781-88, 1953.
- Kirby, D. B.: General Akinesia in Cataract Surgery. In: *Surgery of Cataract*. Philadelphia, Lippincott, 1950, p. 257.
- Kirby, D. B.: The Advanced Use of Curare and Local Anesthesia in Cataract Surgery. In: *Advanced Surgery of Cataract*. Philadelphia, Lippincott, 1955, p. 31.
- Kirby, D. B.: Use of curare in cataract surgery. *Arch. Ophthalmol.* 43:678-93, 1950.
- Salem, M. R., Kim, Y., and El-Etr, A. A.: Histamine release following intravenous injection of d-tubocurarine. *Anesthesiology* 29:380-81, 1968.
- Wood-Smith, F. G., Stewart, H. C., and Vickers, M. D.: Muscle Relaxants. In: *Drugs in Anesthetic Practice*. New York, Appleton-Century-Crofts, 1968, p. 262.